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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/527,642	03/14/2005	Masanobu Igeta	267410US26PCT	7107

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EXAMINER	
LEE, CHEUNG	
ART UNIT	**PAPER NUMBER**
2812	

SHORTENED STATUTORY PERIOD OF RESPONSE	NOTIFICATION DATE	DELIVERY MODE
3 MONTHS	04/03/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 04/03/2007.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/527,642	IGETA ET AL.	
	Examiner	Art Unit	
	Cheung Lee	2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 February 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *16-20* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 March 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *7-15-05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicants' election with traverse of Group I, claims 1-15, in the reply filed on February 26, 2007 is acknowledged. The traversal is on the ground(s) that the inventions listed in Groups I and II do not lack the same or corresponding special technical features, and a search and examination of the entire application would not place a serious burden on the examiner. This is not found persuasive because Group II is drawn to an apparatus, which can be used to etch films or to form a gate electrode, etc., not just to be used to form an insulating film. Therefore, Group II does not relate to a single general inventive concept. Also, Group I (claims 1-15) is drawn to method, and Group II (claims 16-20) is drawn to apparatus. Method and apparatus are classified not just in two different sub-classes, but also in two different classes, and two different search areas. Even though there is an overlapping in the search areas, additional search has to be done for each specific group. Therefore, a burden would be placed examining all groups of claims upon the examiner.

The requirement is still deemed proper and is therefore made FINAL.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on July 15, 2005 was filed before the first action on the merits. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-3, 8-10 and 15 are rejected under 35 U.S.C. 102(e) as being anticipated by Mogami et al. (US Pat. 6459126; hereinafter "Mogami").

4. Referring to figures 1-18 and related text, Mogami discloses [Re claim 1] a method for forming an insulating film 42 on a substrate 10 to be processed, comprising the steps of: forming nitrogen radicals and oxygen radicals (col. 5, lines 55-67) using a high frequency plasma (col. 17, line 65-col. 18, line 5); and supplying the nitrogen radicals and the oxygen radicals (col. 16, lines 15-20) to a surface of the substrate to form the insulating film thereon (col. 17, lines 37-50; see fig. 9A).

5. Referring to figures 1-18 and related text, Mogami discloses [Re claim 2] a method for forming an insulating film 42 on a silicon containing substrate 10 to be processed, comprising the steps of: forming a gas mixture by mixing a nitrogen gas or a nitrogen compound gas with an oxygen gas or an oxygen compound gas (col. 6, lines 18-26); exciting the gas mixture using a high frequency plasma to produce nitrogen radicals and oxygen radicals (col. 17, line 65-col. 18, line 5); supplying the nitrogen

radicals and the oxygen radicals (col. 16, lines 15-20) to a surface of the substrate (col. 17, lines 37-50); and creating an insulating film 42 containing nitrogen (col. 17, lines 37-50) with the nitrogen radicals and the oxygen radicals (col. 17, lines 37-50) on the surface of the substrate (see fig. 9A).

6. Referring to figures 1-18 and related text, Mogami discloses [Re claim 8] a method for manufacturing a semiconductor device, comprising the steps of: forming nitrogen radicals and oxygen radicals (col. 5, lines 55-67) using high frequency plasma (col. 17, line 65-col. 18, line 5); supplying the nitrogen radicals and the oxygen radicals (col. 16, lines 15-20) to a surface of a substrate 10 and processing the surface of the substrate (col. 17, lines 37-50; see fig. 9A); and forming an active device (51, 52) on the substrate having the processed surface (see fig. 9B).

7. Referring to figures 1-18 and related text, Mogami discloses [Re claim 9] a method for manufacturing a semiconductor device, comprising the steps of: forming a gas mixture by mixing a nitrogen gas or a nitrogen compound gas with an oxygen gas or an oxygen compound gas (col. 6, lines 18-26); exciting the gas mixture using a high frequency plasma to produce nitrogen radicals and oxygen radicals (col. 17, line 65-col. 18, line 5); supplying the nitrogen radicals and the oxygen radicals (col. 16, lines 15-20) to a surface of a silicon-containing substrate 10 to be processed (col. 17, lines 37-50); creating an insulating film 42 containing nitrogen (col. 17, lines 37-50) on the surface of the substrate with the nitrogen radicals and the oxygen radicals (col. 17, lines 37-50; see fig. 9A).

8. Mogami discloses [Re claims 3 and 10] wherein the substrate is a silicon substrate and the insulating film is an oxynitride film (col. 17, lines 37-50).

9. Mogami discloses [Re claim 15] wherein further comprising the step of forming a gate insulating film of a high-k dielectric material on the insulating film (col. 6, line 58-col. 7, line 14; see fig. 5).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 4, 7, 11 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mogami.

[Re claim 4 and 11] Mogami fails to disclose expressly wherein the gas mixture forming step includes the process in which the mixture ratio between the oxygen gas or the oxygen compound gas and the nitrogen gas or the nitrogen compound gas varies with time.

However, Mogami discloses wherein the nitrogen concentration (atom %) is changed while forming the insulating film (see fig. 10). So, the nitrogen gas flow rate may change during the formation of the insulating film. Therefore, the oxygen gas and nitrogen gas mixture ratio varies with time.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to vary the gas mixture ratio, as taught by Mogami, because it would have been to obtain superior electric characteristics for a transistor with variation of the nitrogen concentration (Mogami, col. 7, lines 14-37).

[Re claims 7 and 14] Mogami fails to disclose expressly wherein the high frequency plasma is produced by exciting the nitrogen gas and the oxygen gas at a frequency of 400 kHz – 500 kHz.

However, it would have been obvious to one of ordinary skill in the art at the time of the invention because it is a matter of determining optimum process conditions by routine experimentation with a limited number of species of result effective variables. These claims are prima facie obvious without showing that the claimed ranges achieve unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges or a result effective variable, which do not overlap the prior art ranges,

are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill or art) and *In re Aller*, 105 USPQ 233 (CCPA 1995) (selection of optimum ranges within prior art general conditions is obvious).

11. Claims 5-6 and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mogami in view of Raaijmakers (US Pat. 6511539).

12. [Re claims 5 and 12] Mogami fails to disclose expressly wherein the nitrogen radicals and the oxygen radicals are supplied onto the substrate by being carried by a stream of gas formed to flow along the surface of the substrate; and [Re claims 6 and 13] wherein the stream of gas flows from one side of the substrate to another side facing diametrically against said one side.

Referring to figure 1 and related text, Raaijmakers discloses a carrier gas flow 13, which carries reactant A and radicals B* into a chamber passing in contact with a substrate 5 (col. 5, line 60-col. 6, line 5; col. 6, lines 45-50; see fig. 1), and which flows from one side to another side of the substrate (see arrows in fig. 1).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use a carrier gas flow, as taught by Raaijmakers, because it would have been to carry reactants into contact with a substrate surface (col. 6, line 1) to rapidly form a film on the substrate surface.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cheung Lee whose telephone number is 571-272-5977. The examiner can normally be reached on Monday through Friday from 8:30AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on 571-272-1873. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Cheung Lee

March 27, 2007

MICHAEL LEBENTRITT
SUPERVISORY PATENT EXAMINER